



# Recycled Uranium and Transuranics: Their Relationship to Weldon Spring Site Remedial Action Project



## FACT SHEET

*This fact sheet provides information developed by the former WSSRAP Community Relations Department to provide comprehensive descriptions of key activities that took place throughout the cleanup process at Weldon Spring, Missouri. This site is managed by the U.S. Department of Energy Office of Legacy Management.*

### Introduction

On August 8, 1999, Energy Secretary Bill Richardson announced a comprehensive set of actions to address issues raised at the Paducah Gaseous Diffusion Plant that may have had the potential to affect the health of the workers. One of the issues addressed the need to determine the extent and significance of radioactive fission products and transuranic elements in the uranium feed and waste products throughout the U.S. Department of Energy (DOE) national complex. Subsequently, a DOE agency-wide Recycled Uranium Mass Balance Project (RUMBP) was initiated. For the Weldon Spring Uranium Feed Materials Plant (WSUFMP or later referred to as Weldon Spring), receipts and shipments of "recycled" uranium are best estimated by analyzing other DOE site historical records.

This broad assessment of the flow of recycled uranium within the DOE complex determined that Weldon Spring received relatively small quantities of uranium materials that may have contained the constituents of recycled uranium. Subsequently, RUMBP identified the Weldon Spring Site as a "minor" receiver/processor of recycled uranium. A discussion of the constituents of recycled uranium is in the historical perspective section of this fact sheet.

In 1999, the Weldon Spring Site Remedial Action Project (WSSRAP) responded to DOE's concern about transuranics in the recycled uranium by reviewing existing databases and conducting focused analyses of available waste and environmental media. The results of this 1999 effort indicated no detectable presence of transuranics at the Weldon Spring Site. Even if present in the reported small estimated concentrations, the established worker protection and cleanup criteria would not have been changed. This fact sheet provides a summary of the information leading to that conclusion.

### Historical Perspective

In January 1952, the U.S. Atomic Energy Commission (a predecessor to DOE) began recovering uranium from spent reactor fuel to supplement the limited supply of natural uranium. The chemical reprocessing of spent

nuclear fuel for uranium was very efficient, but trace quantities of impurities accompanied the uranium product. These impurities included transuranic elements such as plutonium, neptunium, americium, and long-lived uranium fission products such as technetium. Limits were placed on the allowable residual plutonium content because of its relative value and significance as a nuclear material. Uranium materials were processed to recover all but 10 parts per billion (ppb) of plutonium prior to release. Similar levels of recovery or removal of other transuranics were also conducted. This recovery effort made plutonium and the other transuranic elements only trace quantities in the materials shipped to Weldon Spring.

A 1986 report entitled *Historical Nuclear Materials Balance Report for the Former AEC-Owned Weldon Spring Chemical Plant* was prepared by DOE. It provided a summary of the nuclear materials received and processed at Weldon Spring. The report indicates that Weldon Spring intermittently received, processed, and shipped out relatively small quantities of depleted and slightly enriched uranium material during its operational period of 1957 to 1966. The 1986 materials balance report does not provide information as to the origin of depleted/enriched uranium receipts or the nature of the uranium (recycled versus natural).

The RUMBP report was a summary of nine area reports. The Ohio Report portion of the RUMBP included reviews of four sites: Fernald, Weldon Spring, West Valley, and Reactive Metals, Inc. According to the RUMBP Ohio Report, records from other sites indicated that Mallinckrodt Chemical Works (MCW), the operator of the WSUFMP and other plants in the St. Louis area, began receiving materials containing recycled uranium in 1962. It is known that the depleted/enriched uranium material at least partly originated from reprocessed, or recycled, uranium material. Because it is possible that MCW's natural uranium ore was augmented by recycled uranium material, the DOE report conservatively considered all uranium processed at Weldon Spring after 1962 as "recycled." The DOE reports used these assumptions and the resulting uranium quantities to calculate the "worst-case" quantities of transuranic elements. The quantities of radionuclides of concern reported in the news media (2.4 grams of plutonium,

330 grams of neptunium, and 7200 grams of technetium-99) were excerpted from the Ohio report and represent these worst-case assumptions. As stated in the report, these quantities represent amounts that could have been processed along with the uranium material. These quantities do not represent what was actually processed or, more importantly, what remained at the site. In fact, that report estimates these quantities to be significantly less (0.0 gram of plutonium-239, 12.3 to 15.3 grams of neptunium-237, and 4.9 to 6.1 grams of technetium-99). These estimates also evolve from the report's conservative assumption of 100-percent recycled uranium after 1962.

In the Ohio report, it is assumed that all materials shipped to MCW were shipped to the MCW-Weldon Spring facility. MCW operated two other facilities, and it is not clear that all materials attributed to delivery at the Weldon Spring Plant were shipped to this MCW address. At this point, material shipment records at the Fernald Environmental Management Project (FEMP) correlate approximately with enriched uranium receipt records in the 1986 materials balance report.

## **WSSRAP Data Review**

WSSRAP reviewed existing site historical documents for evidence of previous characterization of transuranic or fission product elements. The following is the finding of this review:

Monitoring data representing environmental conditions in the worker breathing zones, general work areas, and at site perimeters show that levels of airborne alpha-emitting nuclides have been maintained at safe levels throughout the project.

## **Additional Sampling Conducted**

In 1999, it was determined that some limited waste materials remained accessible for sampling, although the majority of the wastes had been placed and covered in the disposal cell. A sampling plan was prepared and executed to analyze these remaining waste materials (contaminated sludge from Raffinate Pits 1, 3, and 4 and contaminated soil from the Ash Pond Storage Area and Frog Pond Outlet) for the constituents of concern.

The laboratory's minimum detection activity level was intentionally established at a low level of less than 0.5% of each sample's estimated total radioactivity (e.g., approximately 0.64 picocurie per gram for plutonium-239). All sample results indicated no detectable transuranic isotopes at the established detection limit.

## **Radiation and Health Effects**

Uranium is known to be a radiological health hazard. As such, the industrial handling of uranium and uranium compounds is controlled to protect workers, the public, and the environment. The greatest health hazard from uranium is associated with inhalation. To control occupational inhalation exposures to acceptable levels, regulatory agencies have established limits on the allowable concentrations of radioactive materials in air. The limits/levels established for WSSRAP for exposure to uranium and thorium are adequate to protect for the transuranic and fission products of concern.

## **1999 Notification of Stakeholders**

When DOE Headquarters concern over transuranic and fission products contamination first became known to WSSRAP in late summer 1999, WSSRAP informed the stakeholders of the project, including workers, the citizen's commission, and regulators. In documents and in briefings, WSSRAP explained what was known about the issues and immediate plans to investigate the possible consequences to WSSRAP and the surrounding community. Following completion of the specific actions taken in 1999 to investigate the presence of transuranic and fission products at WSSRAP, workers, the citizen's commission, and regulatory stakeholders were informed of the findings of no detectable presence of these contaminants at the site. Specific questions and concerns by regulators and the public were addressed, recognizing that the DOE Headquarters office was pursuing the larger question of nationwide distribution of recycled uranium.

## **Where We Are Today**

DOE recognizes the public's concern over the reported information about recycled uranium relative to WSSRAP. DOE is confident that the possible association of recycled uranium with the former operations at Weldon Spring does not constitute a new or unknown hazard for the workers, the community, or the environment. DOE has been working in concert with local, state, and federal regulators and the public since 1986 to ensure that the hazardous and radio-active wastes at the Weldon Spring Site are cleaned up safely with no adverse impact on our local community or our natural resources. We continue our commitment to that mission and pledge our continued cooperation with all our stakeholders to provide the information necessary to resolve these concerns.